

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
B.E: Electronics & Communication Engineering / B.E: Electronics & Telecommunication Engineering
NEP, Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021 – 22)

V Semester

Microwave Theory and Antennas			
Course Code	21EC62	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:1	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3
Course objectives: This course will enable students to : <ul style="list-style-type: none"> • Describe the microwave properties and its transmission media. • Describe the microwave devices for several applications. • Understand the basic concepts of antenna theory. • Identify antenna types for specific applications. 			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none"> 1. Using videos for demonstration of the fundamental principles to students for better understanding of concepts. 2. Demonstration of microwave devices and Antennas in the lab environment where students can study them in real time. 			
Module-1			
Microwave Sources: Introduction, Gunn Diode (Text 2: 7.1,7.1.1,7.1.2) Microwave transmission lines: Microwave frequencies, Microwave devices, Microwave systems. Transmission line equations and solutions, Reflection Coefficient and Transmission Coefficient. Standing wave and standing wave ratio. Smith chart, Single stub matching. Text 2: 0.1, 0.2, 0.3, 3.1, 3.2, 3.3, 3.5, 3.6 (except double stub matching)			
Teaching-Learning Process	Chalk and Talk would be helpful for the quantitative analysis. Videos of the Basic principles of the devices would help students to grasp better. RBT Level: L1, L2, L3		
Module-2			
Microwave Network Theory: Introduction, S matrix representation of multi-port networks (Text 1: 6.1, 6.3, 6.3.1, 6.3.2) Microwave passive devices: Coaxial connectors and Adapters, Attenuators, Phase shifters, waveguide Tees, Magic Tee, Circulator, Isolator. (Text 1: 6.4.2, 6.4.14, 6.4.15, 6.4.16, 6.4.17 A, B)			
Teaching-Learning Process	Chalk and talk method, Power point presentation RBT Level: L1, L2, L3		
Module-3			
Strip Lines: Introduction, Microstrip lines, Parallel Strip lines (Text 2: 11.1,11.2) Antenna Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam efficiency, Directivity and Gain, Antenna Aperture Effective height, Bandwidth, Radio communication Link, Antenna Field Zones (Text 3: 2.1-2.7, 2.9-2.11, 2.13).			
Teaching-Learning Process	Chalk and talk method, Power point presentation and videos. RBT Level: L1, L2, L3		

Module-4	
<p>Point sources and arrays: Introduction, Point Sources, Power patterns, Power theorem, Radiation Intensity, Arrays of 2 isotropic point sources, Pattern multiplication, Linear arrays of n Isotropic sources of equal amplitude and Spacing. (Text 3: 5.1-5.6, 5.9, 5.13)</p> <p>Electric Dipole: Introduction, Short Electric dipole, Fields of a short dipole. Radiation resistance of a short dipole. Thin linear antenna (field analysis). (Text 3: 6.1-6.5)</p>	
Teaching-Learning Process	Chalk and talk method, Power point presentation RBT Level: L1, L2, L3
Module-5	
<p>Loop and Horn antenna: Introduction: Small loop, Comparison of far fields of small loop and Short dipole. Radiation resistance of small loop, Horn Antennas, Rectangular antennas. (Text 3: 7.1, 7.2, 7.4, 7.6, 7.7, 7.8, 7.19, 7.20)</p> <p>Antenna Types: The Helix geometry, Helix modes, Practical design consideration for mono-filar axial mode Helical Antenna, Yagi Uda array, Parabolic Reflector (Text 3: 8.3, 8.4, 8.5, 8.8, 9.5)</p>	
Teaching-Learning Process	Chalk and talk method, Power point presentation RBT Level: L1, L2, L3
<p>Course outcome (Course Skill Set)</p> <p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> 1. Describe the use and advantages of microwave transmission 2. Analyze various parameters related to transmission lines. 3. Identify microwave devices for several applications. 4. Analyze various antenna parameters and their significance in building the RF system. 5. Identify various antenna configurations for suitable applications. 	
<p>Assessment Details (both CIE and SEE)</p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p>Continuous Internal Evaluation:</p> <p>Three Unit Tests each of 20 Marks (duration 01 hour)</p> <ol style="list-style-type: none"> 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester 3. Third test at the end of the 15th week of the semester <p>Two assignments each of 10 Marks</p> <ol style="list-style-type: none"> 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester <p>Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)</p> <ol style="list-style-type: none"> 6. At the end of the 13th week of the semester <p>The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks</p> <p>(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).</p> <p>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per</p>	

the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books:

1. Microwave Engineering -Annapurna Das, Sisir K Das, TMH Publication, 2nd Edition, 2010.
2. Microwave Devices and Circuits – Samuel Y Liao, Pearson Education.
3. Antennas and Wave Propagation -John D Krauss, Ronald J Marhefka, Ahmad S Khan, 4th Edition, McGraw Hill Education, 2013.

Reference Books:

1. Microwave Engineering -David M Pozar, John Wiley India Pvt Ltd., Pvt Ltd., 3rd edition, 2008.
2. Microwave Engineering-Sushrut Das, Oxford Higher Education, 2nd Edn, 2015.
3. Antennas and Wave Propagation- Harish and Sachidananda, Oxford University Press, 2007.

Web links and Video Lectures (e-Resources)

- Nptel Videos and Lectures
- https://www.tutorialspoint.com/antenna_theory/antenna_theory_horn.html
- <http://www.antenna-theory.com/antennas/smallLoop.php>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Lab based demos for the devices can be done in the form of experiments.
- Mini Projects can be given to students involving design of microwave devices and Antennas.

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